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Fremont County, Wyoming

National Eutrophication Survey, Corvallis, Oreg

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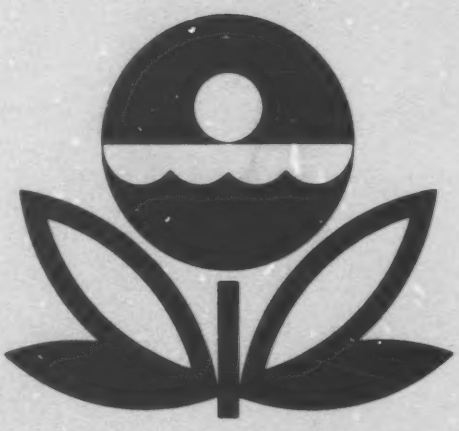

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REPORT
ON
BOYSEN RESERVOIR
FREMONT COUNTY
WYOMING
EPA REGION VIII
WORKING PAPER No. 883

WITH THE COOPERATION OF THE
WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY
AND THE
WYOMING NATIONAL GUARD
JULY, 1977

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16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's freshwater lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Wyoming Department of Environmental Quality for professional involvement, to the Wyoming National Guard for conducting the tributary sampling phase of the Survey, and to those Wyoming wastewater treatment plant operators who voluntarily provided effluent samples.

The staff of the Water Quality Division provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

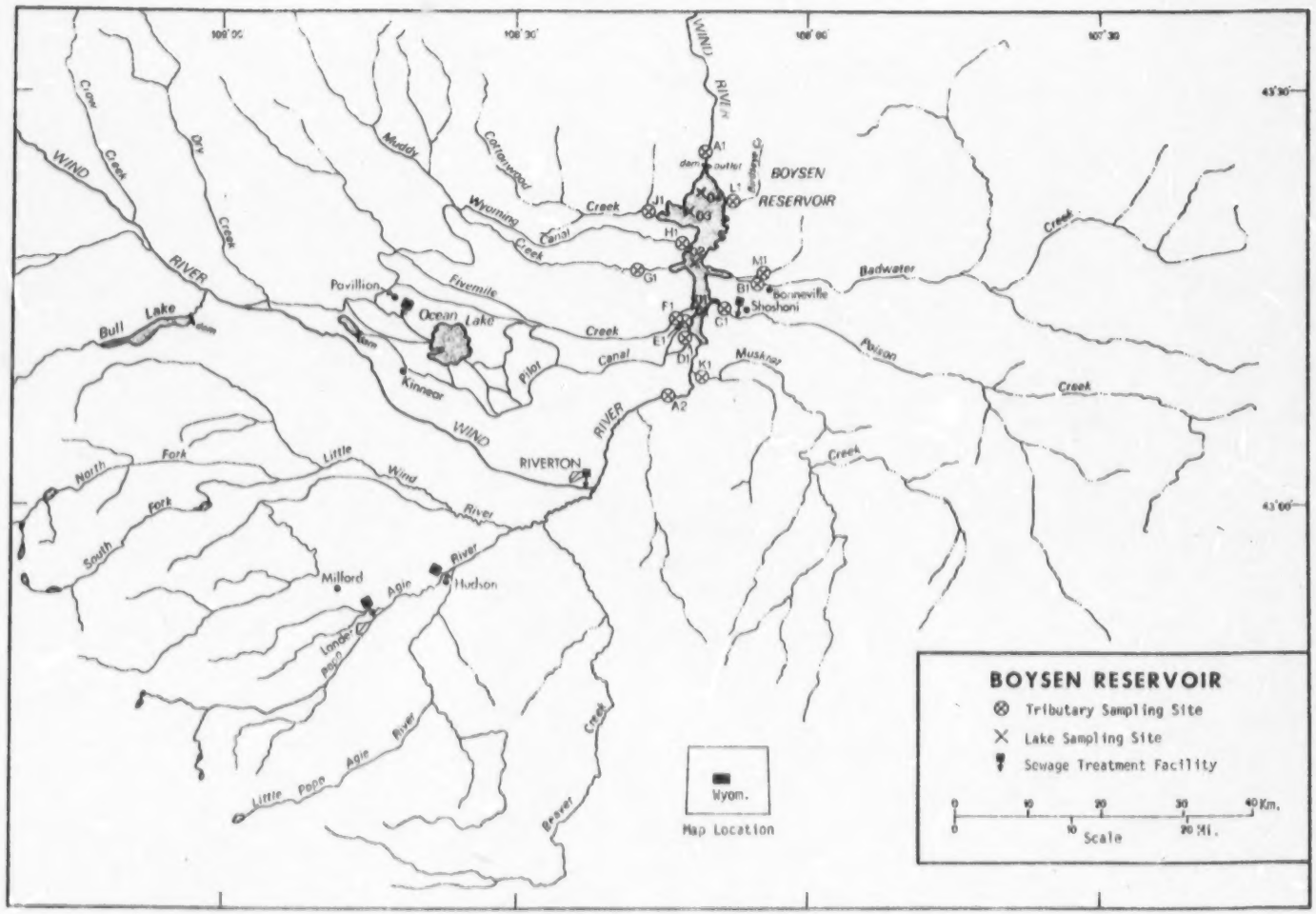
Brigadier General James L. Spence, The Adjutant General of Wyoming, and Project Officer Colonel Donald L. Boyer, who directed the volunteer efforts of the Wyoming National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY RESERVOIRS

State of Wyoming

NAME	COUNTY
Big Sandy	Sublette, Sweetwater
Boulder	Sublette
Boysen	Fremont
De Smet	Johnson
Flaming Gorge	Sweetwater, WY; Daggett, UT
Fremont	Sublette
Glendo	Converse, Platte
Keyhole	Crook
Ocean	Fremont
Seminoe	Carbon
Soda	Sublette
Viva Naughton	Lincoln
Woodruff Narrows	Uinta
Yellowtail	Bighorn, WY; Bighorn, Carbon, MT


BOYSEN RESERVOIR
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
0 10 20 30 40 Km.
0 10 20 Mi.
Scale
Wyom.
Map Location
BOYSEN RESERVOIR
WIND RIVER
Crow Creek
Dry Creek
WIND RIVER
Muddy
Cottonwood Creek
Wyoming Canal
Badwater Creek
Bull Lake
dam
Pavillion
Fivemile Creek
Ocean Lake
dam
Pilot Canal
Kinnear
WIND RIVER
RIVERTON
Muskrat Creek
Poison Creek
North Fork
South Fork
Little Wind River
Milford
Agie River
Hudson
London Park
Little Popo Agie River
Popo Agie River
Beaver Creek
Boysen Dam
Bonneville
Shoshoni
A1
A2
B1
C1
D1
E1
F1
G1
H1
J1
K1
L1
M1
43°30'
43°00'

BOYSEN RESERVOIR

STORET NO. 5603

I. CONCLUSIONS

A. Trophic Condition:

Survey data indicate that Boysen Reservoir is eutrophic. It ranked eleventh in overall trophic quality when the 14 Wyoming lakes and reservoirs sampled in 1975 were compared using a combination of six water quality parameters*. Seven of the water bodies had less median total phosphorus, seven had less and two had the same median dissolved orthophosphorus, ten had less median inorganic nitrogen, seven had less mean chlorophyll a, and ten had greater mean Secchi disc transparency. Marked depression of dissolved oxygen with depth occurred at station 4 in September.

Survey limnologists noted surface clumps of algae at various stations in September and October.

B. Rate-Limiting Nutrient:

The algal assay results are not considered representative of conditions in the reservoir at the time the samples were collected (05/19/75 and 10/17/75) due to significant changes in the nutrient levels in the samples during shipment from the field to the laboratory.

The reservoir data indicate nitrogen limitation at all sampling stations and times, with the exception of station 2 in May and station 4 in September.

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* See Appendix A.

C. Nutrient Controllability:

1. Point sources--During the sampling year, known point sources accounted for 5.8% of the total phosphorus load to Boysen Reservoir. The wastewater treatment plant at Riverton contributed 3.0%. The facilities at Shoshoni, Hudson, and Lander were estimated to have contributed 0.2%, 0.1%, and 2.5%, respectively, but further investigation would be needed to determine the actual contribution of those sources.

The present loading of 3.56 g/m^2/year is five times that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic loading (see page 14). It is calculated that an 80% reduction of the phosphorus load would be required to lower the loading to the eutrophic level. This would involve control of non-point as well as point-source phosphorus inputs.

2. Non-point sources--Non-point sources contributed 94.2% of the total phosphorus loading during the sampling year. The Wind River contributed 77.4%, Fivemile Creek contributed 7.7%, and six other gaged tributaries collectively contributed 4.8%. The ungaged minor tributaries and immediate drainage contributed an estimated 3.8%.

The phosphorus export rates of Fivemile Creek and the Wind River, 23 kg and 22 kg/km^2/year, were substantially greater than the rates of the other tributaries of the reservoir (mean of 3 kg/

km^2/year; see page 13). This may be indicative of unknown point sources, underestimation of point source loads, or substantial inputs from non-point sources. For Fivemile Creek, part of the high export rate is due to the outflow of eutrophic Ocean Lake* and drainage from surrounding agricultural lands. Further investigation is needed to determine the controllability of nutrients from non-point sources within the Wind River and Fivemile Creek drainages.

* Working Paper No. 889.

II. RESERVOIR AND DRAINAGE BASIN CHARACTERISTICS†

A. Morphometry††:

1. Surface area: 89.84 kilometers^2.
2. Mean depth: 10.4 meters.
3. Maximum depth: 39.6 meters.
4. Volume: 934.336 x 10^6 m^3.
5. Mean hydraulic retention time: 270 days (based on outflow).

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)*
Wind River	11,370.1	39.900
Badwater Creek	2,092.7	0.650
Ditch D-1	-	0.040
Ditch E-1	-	0.059
Fivemile Creek	1,082.6	4.200
Muddy Creek	859.9	0.531
Wyoming Canal	-	0.119
Cottonwood Creek	427.3	0.055
Minor tributaries & immediate drainage -	4,023.2	0.163
Totals	19,855.8	45.717

2. Outlet -

Wind River	19,945.6**	40.000

C. Precipitation***:

1. Year of sampling: 23.3 centimeters.
2. Mean annual: 21.7 centimeters.

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† Table of metric conversions--Appendix B.
†† Martin and Hanson, 1966.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Includes area of reservoir.
*** See Working Paper No. 175.

III. WATER QUALITY SUMMARY

Boysen Reservoir was sampled three times during the open-water season of 1974 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from a number of depths at four stations on the reservoir in May and five stations in September and October (see map, page v). During each visit, a single depth-integrated (4.6 m or near bottom to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the first and last visits, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 4.6 meters at station 1, 15.8 meters at station 2, 16.8 meters at station 3, 29.9 meters at station 4, and 1.5 meters at station 5.

The sampling results are presented in full in Appendix D and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR BOYSEN RESERVOIR
STORET CODE 5603

PARAMETER	1ST SAMPLING (5/19/75) 4 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (9/ 2/75) 5 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (10/17/75) 5 SITES RANGE	MEAN	MEDIAN
TEMP (C)	7.1 - 14.2	11.0	11.3	14.5 - 20.3	19.3	19.8	11.4 - 15.3	14.2	14.5
DISS OXY (MG/L)	7.4 - 11.0	9.0	9.0	0.6 - 7.6	6.3	7.0	7.6 - 9.8	8.0	7.8
CNDCTVY (MCROMO)	500. - 619.	557.	555.	415. - 567.	462.	430.	426. - 465.	444.	446.
PH (STAND UNITS)	8.2 - 8.8	8.5	8.5	7.8 - 8.7	8.4	8.6	8.1 - 8.3	8.2	8.2
TOT ALK (MG/L)	157. - 175.	165.	165.	111. - 166.	125.	118.	118. - 175.	129.	123.
TOT P (MG/L)	0.021 - 0.100	0.040	0.031	0.017 - 0.264	0.051	0.030	0.032 - 0.066	0.040	0.037
ORTHO P (MG/L)	0.007 - 0.024	0.014	0.014	0.004 - 0.062	0.012	0.008	0.006 - 0.027	0.022	0.024
NO2+NO3 (MG/L)	0.060 - 0.180	0.128	0.140	0.020 - 1.400	0.129	0.040	0.020 - 0.110	0.096	0.100
AMMONIA (MG/L)	0.030 - 0.100	0.049	0.050	0.020 - 0.070	0.025	0.020	0.020 - 0.080	0.043	0.040
KJEL N (MG/L)	0.200 - 0.700	0.480	0.500	0.200 - 0.600	0.338	0.300	0.200 - 0.200	0.200	0.200
INORG N (MG/L)	0.090 - 0.280	0.177	0.190	0.040 - 1.420	0.153	0.060	0.080 - 0.180	0.139	0.140
TOTAL N (MG/L)	0.350 - 0.850	0.608	0.640	0.240 - 1.600	0.467	0.420	0.220 - 0.310	0.296	0.300
CHLRPYL A (UG/L)	8.7 - 13.6	10.6	10.1	2.0 - 13.0	6.7	4.3	1.4 - 3.8	2.4	2.4
SECCHI (METERS)	0.2 - 1.5	0.8	0.8	0.3 - 1.5	1.0	1.4	0.3 - 1.1	0.7	0.8

B. Biological Characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
05/19/75	1. Fragilaria sp.	2,777
	2. Asterionella sp.	2,529
	3. Chroomonas (?) sp.	397
	4. Centric diatoms	248
	5. Cryptomonas sp.	124
	Other genera	100
	Total	6,175
09/02/75	1. Aphanizomenon sp.	1,129
	2. Chroomonas (?) sp.	635
	3. Cryptomonas sp.	212
	4. Anabaena sp.	71
	5. Dinobryon sp.	47
	Other genera	93
	Total	2,187
10/17/75	1. Chroomonas (?) sp.	350
	2. Navicula sp.	225
	3. Aphanizomenon sp.	125
	4. Cryptomonas sp.	75
	5. Synedra sp.	50
	Other genera	100
	Total	925

2. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (µg/l)
05/19/75	1	8.7
	2	11.3
	3	8.9
	4	13.6
	5	-
09/02/75	1	10.9
	2	4.3
	3	3.1
	4	2.0
	5	13.0
10/17/75	1	2.6
	2	1.7
	3	2.4
	4	1.4
	5	3.8

C. Limiting Nutrient Study:

Due to significant changes in nutrient levels in the samples during shipment from the field to the laboratory, the algal assay results are not considered representative of conditions in the reservoir at the time the samples were collected (05/19/75 and 10/17/75).

Following is a tabulation of the mean inorganic nitrogen/orthophosphorus ratios at each of the sampling stations and times with the indicated limiting nutrient in parentheses.

Station	05/12/75	09/02/75	10/17/75
1	11/1 (N)	10/1 (N)	7/1 (N)
2	21/1 (P)	7/1 (N)	7/1 (N)
3	13/1 (N?)	7/1 (N)	6/1 (N)
4	8/1 (N)	19/1 (P)	5/1 (N)
5	-	9/1 (N)	13/1 (N?)

Nitrogen limitation, as indicated by the algal assay or by in-reservoir nitrogen to phosphorus ratios, does not necessarily mean that the trophic condition of the reservoir can be improved by controlling nitrogen inputs. In many cases, the apparent condition of nitrogen limitation results from excessive phosphorus input from point sources and is often accompanied by a corresponding increase in primary production. In such cases, the reversal of the enriched condition depends upon phosphorus control, not nitrogen control.

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the Wyoming National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of May, June, and July when two samples were collected at most of the sites. Sampling was begun in October, 1974, and was completed in October, 1975.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Wyoming District Office of the U.S. Geological Survey for the tributary sites nearest the reservoir.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loads shown are those measured minus point-source loads, if any.

Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the means of the nutrient loads, in kg/km^2/year, at stations G-1 and J-1 and multiplying the means by the ZZ area in km^2.

The operator of the Riverton wastewater treatment plant provided monthly effluent samples and corresponding flow data. The operator of the Shoshoni wastewater treatment plant also provided monthly samples, but corresponding flows were not available. Therefore, nutrient loads for Shoshoni were estimated at 1.134 kg P and 3.401 kg N/capita/

* See Working Paper No. 175.

year as were the loads for the wastewater treatment plants at Hudson and Lander which were not sampled.

A. Waste Sources:

1. Known municipal -

Name	Pop. Served	Treatment	Mean Flow (m^3/d)	Receiving Water
Riverton*	7,995	tr. filter	5,495.1	Wind River
Shoshoni*	562	stab. pond	212.7**	Poison Creek
Hudson†	390	stab. pond	147.6**	Little Popo Agie River
Lander†	7,000	stab. pond	2,649.5**	Popo Agie River

2. Known industrial - None

* Treatment plant questionnaires.
** Flows estimated at 0.3785 m^3/capita/day.
† Anonymous, 1971.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/ yr	% of total
a. Tributaries (non-point load) -		
Wind River	247,630	77.4
Badwater Creek	5,685	1.8
Ditch D-1	2,910	0.9
Ditch E-1	1,000	0.3
Fivemile Creek	24,520	7.7
Muddy Creek	1,865	0.6
Wyoming Canal	2,320	0.7
Cottonwood Creek	1,700	0.5
b. Minor tributaries & immediate drainage (non-point load) -	12,070	3.8
c. Known municipal STP's -		
Riverton	9,735	3.0
Shoshoni	635	0.2
Hudson	440	0.1
Lander	7,940	2.5
d. Septic tanks - Unknown	?	-
e. Known industrial - None	-	-
f. Direct precipitation* -	1,570	0.5
Total	320,020	100.0

2. Outputs -

Reservoir outlet - Wind River 30,360

3. Net annual P accumulation - 289,660 kg.

* See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/yr	% of total
a. Tributaries (non-point load) -		
Wind River	1,553,590	58.9
Badwater Creek	30,065	1.1
Ditch D-1	14,635	0.6
Ditch E-1	18,275	0.7
Fivemile Creek	486,795	18.4
Muddy Creek	23,435	0.9
Wyoming Canal	156,520	5.9
Cottonwood Creek	24,435	0.9
b. Minor tributaries & immediate drainage (non-point load) -	168,975	6.4
c. Known municipal STP's -		
Riverton	37,740	1.4
Shoshoni	1,910	0.1
Hudson	1,325	0.1
Lander	23,805	0.9
d. Septic tanks - Unknown	?	-
e. Known industrial - None	-	-
f. Direct precipitation* -	96,990	3.7
Total	2,638,495	100.0

2. Outputs -

Reservoir outlet - Wind River 1,277,070

3. Net annual N accumulation - 1,361,425 kg.

* See Working Paper No. 175.

D. Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km²/yr	kg N/km²/yr
Wind River	22	137
Badwater Creek	3	14
Fivemile Creek	23	450
Muddy Creek	2	27
Cottonwood Creek	4	57

E. Mean Nutrient Concentrations in Ungaged Streams:

Tributary	Mean Total P Conc. (mg/l)	Mean Total N Conc. (mg/l)
Poison Creek	0.617	2.251
Birdseye Creek	0.037	1.611

F. Yearly Loads:

In the following table, the existing phosphorus loadings are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" loading is one at which the receiving water would become eutrophic or remain eutrophic; his "permissible" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic loading would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m^2/yr	3.56	3.22	29.4	15.2

Vollenweider phosphorus loadings ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Boysen Reservoir:

"Dangerous" (eutrophic loading)	0.72
"Permissible" (oligotrophic loading)	0.36

V. LITERATURE REVIEWED

Anonymous, 1971. Inventory of municipal waste facilities. EPA Publ. OWP-1, vol. 8, Washington, DC.

Martin, R. O. R., and Ronald L. Hansen, 1966. Reservoirs in the United States. Water Supply Paper 1838, U.S. Geol. Surv., Wash., DC.

Vollenweider, R. A., and P. J. Dillon, 1974. The application of the phosphorus loading concept to eutrophication research. Natl. Res. Council of Canada Publ. No. 13690, Canada Centre for Inland Waters, Burlington, Ontario.

VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
5601	BIG SANDY RESERVOIR	0.087	0.060	487.667	4.383	8.800	0.020
5602	BOULDER LAKE	0.008	0.040	361.800	2.483	8.400	0.002
5603	BOYSEN RESERVOIR	0.037	0.140	465.923	6.264	14.400	0.014
5604	LAKE DE SMET	0.033	0.040	409.000	11.167	9.400	0.006
5605	FLAMING GORGE RESERVOIR	0.014	0.605	366.461	5.611	12.200	0.003
5606	FREMONT LAKE	0.006	0.040	-22.000	3.783	7.400	0.002
5607	GLENDO RESERVOIR	0.045	0.315	459.182	8.473	12.600	0.014
5608	KEY HOLE RESERVOIR	0.028	0.050	454.583	7.792	14.000	0.004
5609	OCEAN LAKE	0.043	0.040	478.333	7.500	8.600	0.004
5610	SEMINOLE RESERVOIR	0.030	0.130	447.000	2.536	11.000	0.007
5611	SODA LAKE	0.063	0.040	387.500	5.575	15.000	0.014
5612	VIVA NAUGHTON RESERVOIR	0.065	0.120	430.000	25.067	13.200	0.024
5613	WOODRUFF NARROWS RESERVO	0.069	0.105	470.000	12.950	13.200	0.019
5614	YELLOWTAIL RESERVOIR	0.026	0.310	364.500	5.410	10.000	0.017

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
5601	BIG SANDY RESERVOIR	0 (0)	54 (7)	0 (0)	77 (10)	77 (10)	8 (1)	216
5602	BOULDER LAKE	92 (12)	92 (11)	92 (12)	100 (13)	92 (12)	92 (12)	560
5603	BOYSEN RESERVOIR	46 (6)	23 (3)	23 (3)	46 (6)	8 (1)	42 (5)	188
5604	LAKE DE SMET	54 (7)	73 (9)	62 (8)	15 (2)	69 (9)	62 (8)	335
5605	FLAMING GORGE RESERVOIR	85 (11)	0 (0)	77 (10)	54 (7)	46 (6)	85 (11)	347
5606	FREMONT LAKE	100 (13)	73 (9)	100 (13)	85 (11)	100 (13)	100 (13)	558
5607	GLENDO RESERVOIR	31 (4)	8 (1)	31 (4)	23 (3)	38 (5)	42 (5)	173
5608	KEY HOLE RESERVOIR	69 (9)	62 (8)	38 (5)	31 (4)	15 (2)	69 (9)	284
5609	OCEAN LAKE	38 (5)	92 (11)	8 (1)	38 (5)	85 (11)	77 (10)	338
5610	SEMINOLE RESERVOIR	62 (8)	31 (4)	46 (6)	92 (12)	54 (7)	54 (7)	339
5611	SODA LAKE	23 (3)	92 (11)	69 (9)	62 (8)	0 (0)	31 (4)	277
5612	VIVA NAUGHTON RESERVOIR	15 (2)	38 (5)	54 (7)	0 (0)	27 (3)	0 (0)	134
5613	WOODRUFF NARROWS RESERVO	8 (1)	46 (6)	15 (2)	8 (1)	27 (3)	15 (2)	119
5614	YELLOWTAIL RESERVOIR	77 (10)	15 (2)	85 (11)	69 (9)	62 (8)	23 (3)	331

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	5602	BOULDER LAKE	560
2	5606	FREMONT LAKE	558
3	5605	FLAMING GORGE RESERVOIR	347
4	5610	SEMINOLE RESERVOIR	339
5	5609	OCEAN LAKE	338
6	5604	LAKE DE SMET	335
7	5614	YELLOWTAIL RESERVOIR	331
8	5608	KEY HOLE RESERVOIR	284
9	5611	SODA LAKE	277
10	5601	BIG SANDY RESERVOIR	216
11	5603	BOYSEN RESERVOIR	188
12	5607	GLENDO RESERVOIR	173
13	5612	VIVA NAUGHTON RESERVOIR	134
14	5613	WOODRUFF NARROWS RESERVO	119

APPENDIX B

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR WYOMING 08/05/76

LAKE CODE 5603 BOYSEN RESERVOIR

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 19945.6

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
5603A1	19945.6	33.92	32.71	33.02	34.21	38.40	56.18	69.32	39.36	36.87	33.73	36.19	35.57	40.00
5603A2	11370.1	16.99	16.71	17.84	26.33	74.76	153.48	70.51	22.65	20.10	19.26	21.80	18.12	39.90
5603B1	2092.7	0.023	0.538	1.076	1.161	1.982	1.784	0.481	0.198	0.227	0.198	0.113	0.028	0.650
5603D1	0.0	0.0	0.0	0.0	0.0	0.0	0.113	0.085	0.142	0.142	0.0	0.0	0.0	0.040
5603E1	0.0	0.0	0.0	0.0	0.0	0.142	0.142	0.142	0.142	0.142	0.0	0.0	0.0	0.059
5603F1	1082.6	1.27	1.33	1.42	2.01	4.47	7.48	8.86	8.98	7.31	3.62	1.95	1.50	4.20
5603G1	859.9	0.057	0.142	0.396	0.453	0.736	1.076	1.104	1.076	0.651	0.340	0.227	0.085	0.531
5603H1	0.0	0.0	0.0	0.0	0.0	0.142	0.283	0.425	0.283	0.283	0.0	0.0	0.0	0.119
5603J1	427.3	0.0	0.0	0.0	0.028	0.227	0.085	0.085	0.113	0.057	0.057	0.0	0.0	0.055
5603ZZ	4118.1	0.028	0.425	0.057	0.198	0.566	0.425	0.142	0.028	0.028	0.028	0.028	0.028	0.163

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 19945.6
SUM OF SUB-DRAINAGE AREAS = 19950.8

TOTAL FLOW IN = 548.14
TOTAL FLOW OUT = 479.46

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
5603A1	10	74	30.865	7	34.830				
	11	74	30.299	4	28.600				
	12	74	42.192	2	29.450				
	1	75	33.131	2	56.067				
	2	75	28.883						
	3	75	29.166	3	29.166				
	4	75	37.945	1	29.166				
	5	75	45.307	1	22.285	15	33.980		
	6	75	64.562	3	62.297	16	66.261		
	7	75	119.780	1	65.695	15	158.574		
	8	75	60.881	1	71.925				
	9	75	39.077	2	46.156				
5603A2	10	74	25.485	7	25.485				
	11	74	21.521	4	25.485				
	12	74	15.574						
	1	75	13.309						
	2	75	14.158						
	3	75	17.556						
	4	75	14.725	1	16.990				
	5	75	36.812	1	12.459	15	29.733		
	6	75	105.622	16	147.531				
	7	75	173.299	15	207.562				
	8	75	20.530	1	55.784				
	9	75	12.176	2	11.100				

TRIBUTARY FLOW INFORMATION FOR WYOMING 08/05/76

LAKE CODE 5603 BOYSEN RESERVOIR

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
5603B1	10	74	0.0						
	11	74	0.0						
	12	74	0.0						
	1	75	0.0						
	2	75	0.142	2	0.142				
	3	75	0.566	3	0.283				
	4	75	1.133	1	0.566				
	5	75	5.663	1	12.743	15	1.246		
	6	75	14.158	3	29.733	16	28.317		
	7	75	8.495	1	22.653	15	1.416		
	8	75	0.142						
	9	75	0.142	2	0.283				
5603D1	10	74	0.0						
	11	74	0.0						
	12	74	0.0						
	1	75	0.0						
	2	75	0.0						
	3	75	0.0						
	4	75	0.0						
	5	75	0.142	1	0.142				
	6	75	0.113	16	0.113				
	7	75	0.085						
	8	75	0.142	1	0.227				
	9	75	0.142	2	0.085				
5603E1	10	74	0.0						
	11	74	0.0						
	12	74	0.0						
	1	75	0.0						
	2	75	0.0						
	3	75	0.0						
	4	75	0.0						
	5	75	0.113	15	0.057				
	6	75	0.142	3	0.142				
	7	75	0.170	1	0.227				
	8	75	0.142	15	0.142				
	9	75	0.142	2	0.142				
5603F1	10	74	3.964	7	4.219				
	11	74	2.464	4	2.860				
	12	74	1.812	2	1.926				
	1	75	1.671	2	1.586				
	2	75	1.388						
	3	75	1.472	3	1.869				
	4	75	1.416	1	1.133				
	5	75	3.398	1	2.492	15	4.389		
	6	75	7.900	3	4.219	16	7.362		
	7	75	12.035	1	9.288	15	12.063		
	8	75	12.431	1	13.026				
	9	75	9.203	2	10.477				

47

TRIBUTARY FLOW INFORMATION FOR WYOMING 08/05/76

LAKE CODE 5603 BOYSEN RESERVOIR

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
5603G1	10	74	0.453	7	0.340				
	11	74	0.396	4	0.425				
	12	74	0.170	2	0.510				
	1	75	0.170						
	2	75	0.255						
	3	75	0.425	3	0.368				
	4	75	0.595	1	0.736				
	5	75	1.586	1	0.453	15	1.359		
	6	75	1.699	3	0.850	16	1.501		
	7	75	1.812	1	1.501	15	1.699		
	8	75	1.699	1	1.699				
	9	75	0.878	2	1.246				
5603H1	10	74	0.0						
	11	74	0.0						
	12	74	0.0						
	1	75	0.0						
	2	75	0.0						
	3	75	0.0						
	4	75	0.0						
	5	75	0.142						
	6	75	0.283	3	0.255	16	0.311		
	7	75	0.425	1	0.425	15	0.425		
	8	75	0.283	1	0.283				
	9	75	0.283						
5603J1	10	74	0.057	7	0.085				
	11	74	0.057	4	0.057				
	12	74	0.057	2	0.057				
	1	75	0.057						
	2	75	0.057						
	3	75	0.057	3	0.057				
	4	75	0.057	1	0.057				
	5	75	0.142	1	0.113	15	0.142		
	6	75	0.113	3	0.142				
	7	75	0.085	1	0.085	15	0.057		
	8	75	0.057	1	0.057				
	9	75	0.057						
5603ZZ	10	74	0.028						
	11	74	0.028						
	12	74	0.028						
	1	75	0.028						
	2	75	0.283						
	3	75	0.142						
	4	75	0.425						
	5	75	1.133						
	6	75	0.850						
	7	75	0.283						
	8	75	0.142						
	9	75	0.142						

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 76/08/05

560301
43 14 30.0 108 10 45.0 3
BOYSEN RESERVOIR
56013 WYOMING

090291

11EPALES 2111202
0009 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/05/19	13	30 0000	14.1	7.4	8	584	8.20	160	0.100	0.600	0.180	0.024
	13	30 0005	13.8	7.8		593	8.40	164	0.080	0.500	0.170	0.023
75/09/02	11	45 0000	20.2	7.2	13	510	8.60	135	0.020	0.600	0.040	0.009
	11	45 0005	20.0	7.0		504	8.60	135	0.020	0.400	0.040	0.008
	11	45 0015	19.7	7.2		508	8.60	119	0.040	0.400	0.080	0.008
75/10/17	16	15 0000	14.1	8.4	26	438	8.15	133	0.020K	0.200	0.100	0.020
	16	15 0005	13.9	8.2		438	8.20	133	0.020K	0.200	0.100	0.020
	16	15 0015	12.3	7.6		426	8.20	145	0.060	0.200K	0.090	0.015

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/05/19	13	30 0000	0.100	8.7	
	13	30 0005	0.072		
75/09/02	11	45 0000	0.075	10.9	
	11	45 0005	0.044		
	11	45 0015	0.062		
75/10/17	16	15 0000	0.037	2.6	
	16	15 0005	0.039		
	16	15 0015	0.066		

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/05

560302
43 18 03.0 108 11 47.0 3
BOYSEN RESERVOIR
56013 WYOMING

090291

11EPALES 2111202
0037 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/05/19	14 40	0000	14.2	7.6	14	597	8.50	165	0.060	0.700	0.150	0.008
	14 40	0005	14.2	8.4		593	8.50	163	0.060	0.600	0.150	0.007
	14 40	0015	13.8	8.6		619	8.40	175	0.050	0.500	0.140	0.012
	14 40	0033	9.8	8.0		583	8.50	175	0.060	0.200	0.150	0.013
75/09/02	11 15	0000	20.3	7.2	54	426	8.65	118	0.020	0.300	0.020K	0.006
	11 15	0005	20.2	7.2		423	8.70	115	0.020K	0.300	0.020K	0.005
	11 15	0015	20.1	7.6		427	8.65	118	0.020	0.400	0.020	0.007
	11 15	0030	19.8	7.4		430	8.60	117	0.020	0.400	0.020	0.006
	11 15	0052	19.8	6.8		438	8.60	116	0.030	0.400	0.040	0.009
75/10/17	14 40	0000	14.9	8.4	34	437	8.20	127	0.070	0.200	0.100	0.026
	14 40	0005	14.6	7.8		430	8.20	129	0.080	0.200	0.100	0.023
	14 40	0015	14.1	8.0		450	8.20	140	0.050	0.200	0.100	0.019
	14 40	0045	13.2	8.0		458	8.25	142	0.050	0.200	0.100	0.019

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/05/19	14 40	0000	0.050	11.3	
	14 40	0005	0.056		
	14 40	0015	0.033		
	14 40	0033	0.035		
75/09/02	11 15	0000	0.021	4.3	
	11 15	0005	0.030		
	11 15	0015	0.024		
	11 15	0030	0.025		
	11 15	0052	0.068		
75/10/17	14 40	0000	0.039	1.7	
	14 40	0005	0.037		
	14 40	0015	0.044		
	14 40	0045	0.047		

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/05

560303
43 21 22.0 108 12 49.0 3
BOYSEN RESERVOIR
56013 WYOMING

130791

11EPALES 2111202
0043 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/05/19	15 00	0000	8.9	9.8	48	530	8.30	169	0.040	0.400	0.130	0.017
	15 00	0005	8.9	9.4		528	8.50	169	0.040	0.300	0.120	0.014
	15 00	0017	8.3	9.2		523	8.50	157	0.050	0.400	0.160	0.014
	15 00	0038	7.1	8.8		505	8.50	160	0.050	0.300	0.150	0.012
75/09/02	10 40	0000	19.8	7.0	57	415	8.60	111	0.020	0.300	0.030	0.006
	10 40	0005	19.8	7.0		416	8.60	114	0.020K	0.300	0.020	0.007
	10 40	0015	19.8	7.2		418	8.60	114	0.020K	0.300	0.020	0.005
	10 40	0030	19.8	7.0		417	8.60	115	0.020	0.300	0.020	0.006
	10 40	0046	18.6	4.4		463	8.20	125	0.020K	0.200	0.160	0.024
75/10/17	17 00	0000	15.3	7.6	42	432	8.30	118	0.040	0.200K	0.110	0.025
	17 00	0005	14.6	7.6		430	8.25	120	0.040	0.200	0.100	0.024
	17 00	0015	14.4	8.2		441	8.20	123	0.040	0.200	0.100	0.024
	17 00	0035	14.4	7.8		448	8.20	122	0.040	0.200	0.100	0.025
	17 00	0055	14.3	8.0		454	8.20	119	0.040	0.200	0.100	0.025

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/05/19	15 00	0000	0.031	8.9	
	15 00	0005	0.024		
	15 00	0017	0.023		
	15 00	0038	0.028		
75/09/02	10 40	0000	0.023	3.1	
	10 40	0005	0.019		
	10 40	0015	0.017		
	10 40	0030	0.018		
	10 40	0046	0.038		
75/10/17	17 00	0000	0.037	2.4	
	17 00	0005	0.038		
	17 00	0015	0.034		
	17 00	0035	0.034		
	17 00	0055	0.038		

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/05

560304
43 23 07.0 108 11 15.0 3
BOYSEN RESERVOIR
56013 WYOMING
090291

11EPALES 2111202
0050 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/05/19	15 20	0000	11.9	9.4	60	567	8.60	159	0.030	0.500	0.060	0.017
	15 20	0005	11.3	9.0		555	8.80	164	0.030	0.600	0.070	0.015
	15 20	0020	11.5	11.0		555	8.50	168	0.030	0.600	0.060	0.019
	15 20	0030	9.5	11.0		530	8.60	166	0.030	0.500	0.090	0.009
	15 20	0046	7.4	10.0		500	8.50	165	0.030	0.500	0.140	0.012
75/09/02	10 05	0000	19.9	6.6	60	423	8.40	112	0.030	0.300	0.040	0.009
	10 05	0005	20.0	6.4		420	8.45	114	0.020	0.200	0.040	0.008
	10 05	0015	19.8	6.8		422	8.40	114	0.020K	0.200	0.050	0.011
	10 05	0035	19.1	4.0		456	8.15	120	0.020K	0.200	1.400	0.025
	10 05	0065	15.3	3.4		523	7.80	145	0.020K	0.200	0.300	0.062
	10 05	0098	14.5	0.6		538	7.75	146	0.070	0.400	0.300	0.014
75/10/17	17 20	0000	14.6	7.8		447	8.30	121	0.040	0.200	0.100	0.024
	17 20	0005	14.6	7.6		446	8.25	119	0.040	0.200K	0.100	0.024
	17 20	0015	14.6	7.6		451	8.25	123	0.040	0.200	0.100	0.025
	17 20	0040	14.6	8.2		458	8.20	122	0.050	0.200	0.100	0.025
	17 20	0070	14.5	7.8		453	8.20	121	0.020K	0.200	0.100	0.027
	17 20	0094	14.5	7.7		465	8.20	124	0.020K	0.200K	0.100	0.027

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/05/19	15 20	0000	0.021	13.6	
	15 20	0005	0.039		
	15 20	0020	0.030		
	15 20	0030	0.028		
	15 20	0046	0.023		
75/09/02	10 05	0000	0.020	2.0	
	10 05	0005	0.022		
	10 05	0015	0.022		
	10 05	0035	0.045		
	10 05	0065	0.077		
	10 05	0098	0.264		
75/10/17	17 20	0000	0.032	1.4	
	17 20	0005	0.035		
	17 20	0015	0.037		
	17 20	0040	0.034		
	17 20	0070	0.042		
	17 20	0094	0.045		

K VALUE KNOWN TO BE

STORET RETRIEVAL DATE 76/08/05

560305
43 12 16.0 108 11 02.0 3
BOYSEN RESERVOIR
56013 WYOMING

11EPALES 760109 2111202
0008 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO26NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/09/02	11 55	0000	19.5	7.2	14	567	8.40	165	0.030	0.500	0.020K	0.006
	11 55	0005	18.8	6.8		562	8.50	166	0.020K	0.500	0.020K	0.004
75/10/17	16 00	0000	11.4	9.8	13	435	8.35	175	0.060	0.200K	0.020K	0.006

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/09/02	11 55	0000	0.055	13.0	
	11 55	0005	0.099		
75/10/17	16 00	0000	0.037	3.8	

K VALUE KNOWN TO BE
LESS THAN INDICATED

APPENDIX E

TRIBUTARY AND WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 76/08/05

5603A1
43 25 03.0 108 10 37.0 4
WIND RIVER
56 7.5 BOYSEN
U/BOYSEN RESERVOIR 090291
BELOW BOYSEN DAM 1.3 MI NNW BOYSEN CAMP
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/07	08 20		0.104	0.400	0.045	0.020	0.035
74/11/04	08 10		1.010	0.900	0.050	0.025	0.040
74/12/02	09 00		0.140	0.600	0.075	0.015	0.020
75/01/02	09 05		0.144	0.600	0.048	0.015	0.020
75/03/03	08 31		0.110	0.450	0.040	0.015	0.015
75/04/01	10 30		0.260	0.450	0.040	0.005	0.020
75/05/01	09 50		0.150	2.200	0.085	0.010	
75/05/15	07 15		0.135	0.700	0.077	0.005K	0.010K
75/06/03	11 15		0.075	0.500	0.040	0.005	0.010
75/06/16	13 30		0.080	2.000	0.060	0.005	0.020
75/07/01	10 15		0.075	1.700	0.070	0.015	0.020
75/07/15	09 00		0.130	0.400	0.035	0.020	0.030
75/08/01	09 00		0.150	0.400	0.020	0.025	0.030
75/09/02	18 40		0.125	0.600	0.015	0.025	0.040
75/10/02	11 10		0.080	0.600	0.060	0.040	0.060

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/05

5603A2
43 07 45.0 108 13 30.0 4
WIND RIVER
56 7.5 HIDDEN VALLY
T/BOYSEN RESERVOIR 090291
BNK END OF RD .6 MI S OF AIRSTRIP
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/07	11 45		0.056	0.800	0.025	0.010	0.050
74/11/04	10 20		0.272	0.600	0.025	0.020	0.050
75/04/01	14 10		0.190	0.900	0.080	0.045	0.140
75/05/01	13 05		0.070	1.850	0.080	0.045	0.050K
75/05/15	11 10		0.085	2.000	0.045	0.050	0.500
75/06/16	15 05		0.075	2.000	0.085	0.040	0.400
75/07/15	11 45		0.065	0.950	0.020	0.030	0.310
75/08/01	13 35		0.010	0.100	0.010	0.020	0.040
75/09/02	08 05		0.065	0.600	0.025	0.030	0.080

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/05

5603B1
43 16 10.0 108 04 45.0 4
BADWATER CREEK
56 7.5 BONNEVLLE
T/BOYSEN RESERVOIR 090291
GAGING STATION .4 MI W OF BONNEVILLE
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
75/02/02	14 10		0.005K	0.700	0.017	0.008K	0.020
75/03/03	09 00		0.005	1.200	0.025	0.010	0.010
75/04/01	11 20		0.105	0.600	0.045	0.010	0.130
75/05/01	10 15		0.195	2.200	0.040	0.035	0.920
75/05/15	07 45		0.130	3.180	0.030	0.045	2.600
75/06/03	11 40		0.070	1.950	0.020	0.040	1.900
75/06/16	14 00		0.030	4.700	0.050	0.035	0.580
75/07/01	10 45		0.040	0.900	0.025	0.040	0.440
75/07/15	09 45		0.030	0.850	0.020	0.035	0.210
75/08/01	11 15		0.010	0.900	0.020	0.015	0.030
75/10/02	11 32		0.035	1.400	0.030	0.005	0.090

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/05

5603C1
43 14 11.0 108 08 20.0 4
POISON CREEK
56 7.5 HIDDEN VALLY
T/BOYSEN RESERVOIR 090291
400 FT END DRT RD .8 MI ENE#TR TANK HILL
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/11/04	08 55		0.080	1.300	0.050	0.450	0.610
75/04/01	12 15		0.095	4.000	1.250	0.313	0.770
75/05/01	11 55		0.040	0.600	0.165	0.570	0.690
75/06/03	12 25		0.185	5.000	0.775	0.400	0.810
75/06/16	14 40		0.125	3.150	0.250	0.410	0.570
75/07/01	11 15		0.160	1.700	0.260	0.550	0.740
75/07/15	10 45		0.070	1.880	0.065	0.725	0.920
75/08/01	11 25		0.010	2.200	0.045	0.620	0.920
75/09/02	07 20		0.005	0.700	0.025	0.050	0.080
75/10/02	12 23		0.010	1.200	0.050	0.025	0.060

STORET RETRIEVAL DATE 76/08/05

560301
43 12 11.0 108 12 06.0 4
DITCH
56 7.5 HIDDEN VALLY
T/BOYSEN RESERVOIR 090291
BRDG ON LOTY RD 2.5 MI NE VALLEY VIEW SR
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
75/05/01	12	45	0.015	0.900	0.015	0.010	0.060
75/06/16	15	30	0.010	0.900	0.040	0.015	0.070
75/08/01	15	15	0.210	0.150	0.020	0.020	0.070
75/09/02	07	45	0.005	0.200	0.005K	0.010	0.040

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/05

5603E1
43 13 21.0 108 12 26.0 4
DITCH
56 7.5 HIDDEN VALLY
T/BOYSEN RESERVOIR 090291
BRDG ON DIRT RD 3.1 MI NE VLY VIEW STORE
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
75/02/02	15	15	3.765	1.300	0.068	0.012	0.040
75/05/15	11	30	0.005	0.950	0.020	0.010	0.060
75/06/03	12	35	0.005	0.250	0.005	0.005K	0.040
75/07/01	11	25	0.005	1.200	0.025	0.025	0.050
75/07/15	11	00	0.010	0.450	0.020	0.035	0.105
75/09/02	08	30	0.005	0.800	0.025	0.020	0.065
75/10/02	12	35	0.010	0.700	0.015	0.005K	0.020

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/05

5603F1
43 13 21.0 108 13 07.0 4
FIVEMILE CREEK
56 7.5 HIDDEN VALLY
T/BOYSEN RESERVOIR 090291
BRDG ON LDTY RD .4 MI NW JCT W US 26
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/07	12	15	1.680	1.200	0.020	0.005	0.035
74/11/04	10	40	2.240	1.350	0.025	0.010	0.025
74/12/02	11	10	3.110	1.100	0.030	0.005K	0.020
75/01/02	10	00	3.400	1.100	0.056	0.005	0.020
75/03/03	10	00	3.150	2.700	0.095	0.025	0.110
75/04/01	12	35	3.700	1.650	0.070	0.012	0.060
75/05/01	11	15	1.780	0.900	0.039	0.028	0.200
75/05/15	10	45	1.050	0.900	0.070	0.010	0.240
75/06/03	13	55	0.740	0.450	0.015	0.025	0.080
75/06/16	15	40	0.710	4.400	0.065	0.165	0.500
75/07/01	11	39	0.630	8.800	0.120	0.065	0.330
75/07/15	14	00	0.530	1.300	0.040	0.085	0.250
75/08/01	13	45	0.600	0.850	0.020	0.075	0.210
75/09/02	08	40	0.660	0.700	0.015	0.030	0.110
75/10/02	12	40	0.970	1.500	0.030	0.010	0.070

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/05

5603G1
43 17 10.0 108 16 30.0 4
MUDDY CREEK
56 7.5 MEX. PASS SE
T/BOYSEN RESERVOIR 090291
GAGING STATN 1.5 MI SW OF LK CAMEAHWAIT
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/07	12	50	0.504	1.000	0.050	0.005K	0.015
74/11/04	10	50	0.552	0.400	0.020	0.010	0.010
74/12/02	11	30	0.940	1.100	0.045	0.005K	0.010
75/03/03	10	20	0.410	0.900	0.030	0.015	0.040
75/04/01	13	00	0.410	1.150	0.165	0.005K	
75/05/01	11	31	0.270	0.800	0.020	0.010	0.020
75/05/15	10	20	0.050	1.800	0.060	0.025	0.500
75/06/03	12	55	0.010	0.500	0.010	0.010	0.125
75/06/16	15	55	0.270	2.800	0.035	0.090	0.460
75/07/01	11	50	0.215	0.800	0.030	0.035	0.370
75/07/15	13	00	0.400	1.050	0.030	0.025	0.330
75/08/01	14	00	0.400	1.050	0.020	0.040	0.300
75/09/02	08	55	0.230	0.400	0.010	0.010	0.130
75/10/02	13	05	0.250	1.500	0.020	0.010	0.440

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/05

5603M1
43 18 55.0 108 12 02.0 4
WYOMING CANAL
56 7.5 SW BONNEVILLE
T/BOYSEN RESERVOIR 090291
30 FT FRM DRT RD 1.8 MI NE LK CAMEAHWAIT
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
75/02/02	13	45	0.135	0.600	0.032	0.008K	0.020
75/05/15	09	30	0.010	1.150	0.060	0.015	
75/06/03	13	10	0.010	0.300	0.005	0.015	0.060
75/06/16	16	10	0.030	1.000	0.025	0.045	0.270
75/07/01	12	09	0.010	2.100	0.035	0.040	0.140
75/07/15	09	20	0.470	0.300	0.035	0.005	0.030
75/08/01	14	15	0.015	0.450	0.010	0.015	0.070
75/10/02	13	25	0.010	0.600	0.010	0.005K	0.020

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/05

5603J1
43 21 15.0 108 17 05.0 4
COTTONWOOD CREEK
S6 7.5 SE MEX. PASS
T/BOYSEN RESERVOIR 090291
SEC RD BRDG 1.8 MI W OF BOYSEN RES
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/07	13 30		0.990	1.250	0.095	0.005K	0.025
74/11/04	11 15		0.570	1.800	0.020	0.015	
74/12/02	12 25		0.311	0.700	0.037	0.005K	0.010K
75/03/03	10 45		1.400	1.600	0.080	0.030	0.180
75/04/01	13 30		0.490	0.650	0.095	0.010	0.130
75/05/01	11 45		0.190	0.700	0.020	0.005K	0.010K
75/05/15	10 00		0.135	1.450	0.080	0.010	0.180
75/06/03	13 30		0.005	1.000	0.010	0.005	0.180
75/06/07	10 20		0.045	0.050K	0.015	0.020	0.020
75/07/01	12 30		0.005	1.350	0.045	0.015	0.370
75/07/15	13 30		0.100	0.850	0.020	0.005	0.130
75/08/01	14 45		0.125	0.450	0.015	0.005K	0.065

K VALUE KNOWN TO BE
LESS THAN INDICATED

42

STORET RETRIEVAL DATE 76/08/05

5603L1
43 22 28.0 108 07 40.0 4
BIRDSEYE CREEK
56 7.5 BONNEVILE SW
T/BOYSEN RESERVOIR 090291
AT US HWY 20 BRDG 3.3 MI SE BOYSEN DAM
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
75/05/15	07 30		0.220	1.750	0.065		
75/06/03	11 30		0.010	0.750	0.015	0.005	0.050
75/06/16	13 35		0.010	2.300	0.025	0.005	0.030
75/07/01	10 30		0.005	1.400	0.020	0.005	0.030

STORET RETRIEVAL DATE 76/08/05

5603AA IF5603AA P007995
43 01 00.0 108 21 00.0 4
RIVERTON
56 7.5 RIVERTON E.
T/BOYSEN RES. 090291
WIND RIVER
11EPALES 2141204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/02/06 08 00 CP(T)- 75/02/06 16 00			0.200	8.700	5.800	3.800	4.100	1.800	1.400
75/03/03 08 00 CP(T)- 75/03/03 16 00			0.080	22.000	7.900	4.500	5.900	1.400	1.300
75/04/02 00 00 CP(T)- 75/04/02 08 00			0.151	31.000	9.500	5.100	6.000	1.200	1.300
75/04/25 08 00 CP(T)- 75/04/25 16 00			0.100	33.000	11.000	5.800	7.500	1.300	1.300
75/05/15 08 00 CP(T)- 75/05/15 14 00			0.050	27.000	13.000	5.200	6.500	1.400	1.200
75/06/04 00 00 CP(T)- 75/06/04 08 00			0.100	18.000	5.300	3.800	5.700	1.700	1.300
75/06/25 08 00 CP(T)- 75/06/25 15 00			0.050	16.000	0.031		3.800	1.700	1.500
75/07/17 08 00 CP(T)- 75/07/17 15 00			0.575	14.500	0.975	2.600	3.600	1.750	1.680
75/08/06 08 00 CP(T)- 75/08/06 15 00			0.650	13.500	0.710	2.500	3.800	1.790	1.640
75/08/20 08 00 CP(T)- 75/08/20 15 00			0.875	14.500	0.240	2.630	3.550	1.780	1.700
75/09/17 08 00 CP(T)- 75/09/17 15 00			0.325	16.000	0.840	2.750	3.650	1.540	1.600
75/10/04 08 00 CP(T)- 75/10/04 15 00			0.625	17.500	2.100	3.200	4.100	1.390	1.500

44

STORET RETRIEVAL DATE 76/08/05

5603CA PD5603CA P000562
43 13 40.0 108 07 00.0 4
SHOSHONI
56 7.5 SHOSHONI
T/BOYSEN RES. 090291
POISON CREEK
11EPALES 2141204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/02/19	10 00		0.080	15.000	5.100	3.950	4.500		
75/03/27	10 00		0.029	17.000	3.310	4.680	5.700		
75/05/01	13 30		0.050	13.500	0.250	4.100	4.200	0.007	0.007
75/05/29	08 00		0.050	24.000	0.570	5.100	7.300	0.070	
75/09/23	09 30		0.025	16.500	0.225	5.400	6.900		
75/10/15	09 00		0.075	37.000	0.910	7.300	7.300		
75/10/29	08 30		0.050	14.000	0.990	6.800	8.100		
75/11/19	16 00		0.065	17.500	0.168	6.200	7.700		
76/01/12	10 00		0.027	21.000	5.340	4.300	4.800		

45